Head and Neck Pathol (2009) 3:271–275
DOI 10.1007/s12105-009-0139-9

ORIGINAL PAPER

Salivary Gland Tumor: A Review of 599 Cases in a Brazilian Population

Flávia Aparecida de Oliveira · Eliza Carla Barroso Duarte · Cláudia Teixeira Taveira · Aline Abreu Máximo · Érica Carvalho de Aquino · Rita de Cássia Alencar · Eneida Franco Vencio

Received: 24 April 2009 / Accepted: 25 August 2009 / Published online: 16 September 2009

Abstract Salivary gland tumors consist of a group of heterogeneous lesions with complex clinicopathological characteristics and distinct biological behaviors. Worldwide series show a contrast in the relative incidence of salivary gland tumors, with some discrepancies in clinicopathological data. The main aim of this study was to describe demographic characteristics of 599 cases in a population from Central Brazil over a 10-year period and compare these with other epidemiological studies. Benign tumors represented 78.3% of the cases. Women were the most affected (61%) and the male:female ratio was 1:1.6. Parotid gland tumors were the most frequent (68.5% of cases) and patient age ranged from 1 to 88 years-old (median of 45 years old). The most frequent tumors were pleomorphic adenomas (68.4%) and benign tumors were significantly more frequent in the parotid (75.9%), while malignant tumors were more frequent in the minor salivary glands (40%) ($P < 0.05$). In conclusion, women and the parotid gland were the most affected and pleomorphic adenoma was the most frequent lesion, followed by adenoid cystic carcinoma and Warthin's tumor.

Keywords Benign tumor · Epidemiology · Malignant tumor · Salivary gland diseases

F. A. de Oliveira · E. C. B. Duarte
Sector of General Pathology, Instituto de Patologia Tropical e Saúde Pública of the Universidade Federal de Goiás (UFG), Goiânia-GO, Brazil

C. T. Taveira · A. A. Máximo · É. C. de Aquino · E. F. Vencio
Department of Oral Pathology, School of Dentistry, Universidade Federal de Goiás, Goiânia-GO, Brazil

Rita de Cássia Alencar
Department of Pathology, Cancer Hospital Araújo Jorge, Goiânia-GO, Brazil

E. F. Vencio (✉)
Faculdade de Odontologia, Universidade Federal de Goiás, Praça Universitária, s/n, 74605-220 Goiânia-GO, Brazil
e-mail: vencio56@hotmail.com

Introduction

Salivary gland tumors consist of a group of heterogeneous lesions with complex clinicopathological characteristics and distinct biological behaviors [1, 2]. These tumors comprise 3 to 10% of all head and neck neoplasms [3]. Worldwide epidemiological series show geographic variation in the relative incidence of salivary gland tumors, with discrepancies among clinicopathological aspects [4, 5]. Salivary gland tumors are complex neoplasms, due to their broad histological spectrum resulting from multiple tumor cell differentiation [6]. The main aim of this study was to describe the demographic characteristics of 599 cases in a population from Central Brazil over a period of 10 years and compare these data with other epidemiological studies.

Materials and Methods

Files of the Anatomopathological Service of the Araújo Jorge Hospital in Goiânia, Goiás, Brazil were retrieved from the data bank for a 10-year period (1996–2005). This service is one of the reference centers for human cancer in Brazil and the main center in the State of Goiás. Clinicopathological data of salivary gland tumors were reviewed, including age, sex, lesion site and histological types. All cases were classified according to the criteria suggested by the 1991 World Health Organization histological classification [2].

The statistical analysis was carried out using the SigmaStat 2.03 software. The Mann–Whitney test was used for comparison between two groups and the Kruskal–Wallis test for comparison of more than two groups, followed by Dunn's test. For associations the Chi square test was used. The level of significance was set at 5% ($P < 0.05$).

Results

Over the period of 10 years, 599 salivary gland neoplasms were diagnosed in the Araújo Jorge Hospital; of these, 469 (78.3%) were benign, women were more often affected (61.4%) and the male:female ratio was 1:1.6. Predominance for women was seen in almost all histological types, except in Warthin's tumor, which was slightly more frequent among men (63.2%, $P < 0.05$) (Table 1).

The median age of occurrence of all salivary gland tumors was 45 years old, with the peak of incidence in the fourth decade of life (Table 2). The median age for malignant tumors (55 years old) was significantly higher than for benign tumors (43 years old, $P < 0.05$). The peak of incidence for patients with benign tumors was in the fourth decade of life, while for malignant tumors it was in the seventh (Table 2). Patient age for cases involving benign tumors varied widely from 1 to 86 years old, mainly distributed between 20 and 60 years of age. In contrast, patient age for malignant tumor cases ranged from 8 to 88 years old and increased significantly with age, achieving 40% from 70 to 89 years of age ($P < 0.05$, Table 2).

The parotid gland was the most common lesion site, involving 69.5% of cases, followed by submandibular gland (15.8%) and minor salivary glands (14.7%). No sublingual gland tumors were identified. Benign tumors were significantly more frequent in the parotid gland (75.9%), while malignant tumors were significantly more frequent in the minor salivary glands (40%, $P < 0.05$) (Table 3).

The median age of occurrence of tumors in minor salivary glands was 48 and varied widely from 15 to 87 years old. In these sites women were more affected (60.9%) by tumors and the male:female ratio was 1:1.6. The malignant tumors were more frequent (57.5%), being 32% mucoepidermoid carcinoma, 32% adenoid cystic carcinoma and 36% others. Among the benign tumors, the pleomorphic adenoma was the most frequent (86.5%). The palate was the most affected (70.1%) site, followed by buccal mucosa (6.9%) and tongue (5.8%).

Table 1 Distribution of salivary gland tumors according to sex and age in 599 cases

	Sex, *n* (%)		Total, *n* (%)	M:F	Median age (years)	Age range (years)
	Male ($n = 234$)	Female ($n = 365$)				
Tumor type						
Benign	181 (38.6)	288 (61.4)	469 (78.3)	1:1.6	43	1–86
Malignant	53 (40.8)	77 (59.2)	130 (21.7)	1:1.5	55^{+}	8–88
Lesion site						
Parotid	160 (39)	250 (61)	410 (68.5)	1:1.6	45	1–88
Submandibular	36 (39)	57 (61)	93 (15.5)	1:1.6	43	9–82
Minor salivary glands	34 (39)	53 (61)	87 (14.5)	1:1.5	48	15–87
Unspecified location	4 (40)	5 (60)	9 (1.5)	1:1.3	62	32–86
Histological type						
Pleomorphic adenoma	149 (36.7)	257 (63.3*)	406 (67.8)	1:1.7	$41^{\S,\#,\infty}$	1–86
Adenoid cystic carcinoma	13 (33.3)	26 (66.7*)	39 (6.5)	1:2	56^{∞}	8–87
Warthin's tumor	24 (63.2*)	14 (36.8)	38 (6.3)	1:0.6	$59^{\S,\dagger}$	38–78
Adenocarcinoma NOS	19 (51.4)	18 (48.6)	37 (6.2)	1:0.9	$58^{\#}$	28–86
Mucoepidermoid carcinoma	11 (36.7)	19 (63.3*)	30 (5)	1:1.7	$38.5^{\dagger}$	13–83

The histological type in the Table does not represent all 599 cases, because other types showing very small frequencies are not included

Tumor type vs. sex: $P > 0.05$

Lesion site vs. sex: $P > 0.05$

* Histological type vs. sex: $P < 0.05$

$^{+}$ Age vs. tumor type $P < 0.05$

Age vs. lesion site $P > 0.05$

§, †, $^{\#}$ and $^{\infty}$ Age vs. histological type $P < 0.05$

Table 2 Distribution of salivary gland tumors according to age group

Age group (years)	Benign, *n* (%)	Malignant, *n* (%)	Pleomorphic adenoma, *n* (%)	Warthin's tumor, *n* (%)	Cystic adenoid carcinoma, *n* (%)	Mucoepidermoid carcinoma, *n* (%)	Adenocarcinoma NOS, *n* (%)
0–9	3 (0.6*)	1 (0.8)	3 (0.7)	–	1 (2.6)	–	–
10–19	22 (4.7*)	4 (3.1)	22 (5.4)	–	1 (2.6)	2 (7.7)	–
20–29	62 (13.2*)	11 (18.5)	61 (15)	–	3 (7.7)	5 (19.2)	1 (2.8)
30–39	115 (24.5*)	22 (16.9)	110 (27.1)	1 (2.6)	7 (17.9)	9 (34.6)	5 (13.9)
40–49	90 (19.2*)	15 (11.5)	80 (19.7)	3 (7.9)	3 (7.7)	1 (3.8)	7 (19.4)
50–59	83 (17.7*)	25 (19.2)	62 (15.3)	17 (44.7)	8 (20.5)	4 (15.4)	7 (19.4)
60–69	55 (11.7)	26 (20*)	42 (10.3)	8 (21.1)	7 (17.9)	–	11 (30.5)
70–79	35 (7.5)	19 (14.6*)	22 (5.4)	9 (23.7)	6 (15.4)	4 (15.4)	5 (13.9)
80–89	4 (0.9)	7 (5.4*)	4 (1)	–	3 (7.7)	1 (3.8)	–
Total	469	130	360	29	30	21	36

* Benign or malignant tumor vs. age group $P < 0.05$. For statistical analysis age groups 0–9, 10–19 and 20–29; 30–39, 40–49 and 50–59, and 60–69, 70–79 and 80–89 years of age were grouped together

Table 3 Distribution of salivary gland tumors according to lesion site

	Lesion site, *n* (%)			Total, *n* (%)
	Parotid 410 (69.5)	Submandibular 93 (15.8)	Minor salivary glands 87 (14.7)	
Tumor type				
Benign	353 (75.9*)	75 (16.1)	37 (8)	465 (78.8)
Malign	57 (45.6)	18 (14.4)	50 (40*)	125 (21.2)
Histological type				
Pleomorphic adenoma	298 (74#)	73 (18.1)	32 (7.9)	403 (68.4)
Adenocarcinoma NOS	18 (51.4#)	5 (14.3)	12 (34.3)	35 (5.9)
Adenoid cystic carcinoma	13 (33.3)	10 (25.6)	16 (41.1#)	39 (6.6)
Warthin's tumor	36 (94.7#)	2 (5.3)	–	38 (6.4)
Mucoepidermoid carcinoma	13 (44.8)	–	16 (55.2#)	29 (4.9)

Cases involving unknown site were not included in the statistical analysis

* Tumor type vs. site: $P < 0.05$

Histological type vs. site: $P < 0.05$

Pleomorphic adenoma was the most frequent of all benign salivary gland tumors (68.4% of cases), followed by Warthin's tumor (6.4%) (Table 3). The majority of patients were female (60.9%) (Table 2). In the cases of Warthin's tumor, men were significantly more affected (63.2%, $P < 0.05$). Malignant tumors represented 21.7% of all salivary gland tumors. Among malignant tumors, adenoid cystic carcinoma was the most common, representing 6.6% of the cases, followed by adenocarcinoma NOS (5.9%) (Table 3). Women were significantly more affected by adenoid cystic carcinoma (66.7%) and mucoepidermoid carcinoma (63.3%, $P < 0.05$) (Table 1). A significantly greater number of malignant tumors were located in minor salivary glands (40%, $P < 0.05$) (Table 3). Regarding histological type and lesion site, minor salivary glands were more significantly affected by mucoepidermoid carcinoma (55.2%) and adenoid cystic carcinoma (41.1%, $P < 0.05$), while adenocarcinoma NOS was more frequent in the parotid gland (51.4%, $P < 0.05$) (Table 3).

Discussion

In the present review of 599 salivary gland tumors, 78.3% cases were benign. This is in agreement with previously published studies [3, 7–12], though other epidemiological studies showed a predominance of less than 60% for benign tumors [13, 14]. Worldwide studies show geographic variation in the relative incidence of salivary gland tumors with differences in histological type [2, 8].

Salivary gland tumors more often affected women, with an overall male:female ratio of 1:1.5, and a male:female ratio of 1:1.6 for benign tumors and 1:1.5 for malignant tumors. Similarly, other studies describe a male:female

ratio varying from 1:1.2 to 1:3 [12]; however, some authors reported predominance for men with a male:female ratio of 1.4:1 (13). Women were predominantly affected in almost all histologic types, except Warthin's tumor and adenocarcinoma NOS. Some studies have reported male predominance in benign tumors [10] and/or malignant tumors [10, 14]. Benign tumors affected mostly women, though no statistical difference was observed for sex, in agreement with other epidemiological series [9–11].

In the present study, age distribution varied from 1 to 88 years-old, with a median of 45 years of age and a peak incidence from 30 to 39 years of age, as reported by other authors [3, 9–14]. The median age for malignant tumors (55 years old) was significantly higher than for benign tumors (43 years old). The peak incidence for benign tumors was in the fourth decade of life, while for malignant tumors, it was in the seventh, as reported previously [8]. However, one study described a peak incidence for benign tumors in the fifth decade of life and in the seventh decade for malignant tumors [10], while another study reported a similar age risk for benign tumors, but not for malignant tumors, from 30 to 49 years of age [14].

The majority of salivary gland tumors were located in the parotid gland (69.5%), followed by the submandibular gland (15.8%) and minor salivary glands (14.7%). No case was identified in the sublingual gland, as mentioned in other studies [3, 9, 10, 12]. This confirms the rarity of salivary tumors at this site. Some authors registered less involvement of the parotid gland in salivary gland tumors, showing only 36.6% [15] and 45.6% of the cases [13]. The second most common lesion site was the submandibular gland, although some authors reported the minor salivary glands in second place after the parotid gland [10, 12, 14, 15]. Discrepancies in the frequency of salivary gland tumors in the submandibular gland and minor salivary glands were observed among other series, varying from 9.5 to 24.3% and 3 to 31.4%, respectively (Table 4). According to other reports, the palate was the most frequent site of the minor salivary glands tumors [10, 12, 13, 15].

Pleomorphic adenoma was the most common histological type, corresponding to 68.4% of all salivary gland tumors and 86.7% of benign tumors. Predominance of pleomorphic adenoma was reported in other series (Table 4). According to other studies [10, 12], Warthin's

Table 4 Comparison of representative percentages of epithelial salivary gland tumors of worldwide series

	Present study, Brazil	Ito et al. [10], Brazil	Lima et al. [11], Brazil	Vargas et al. [9], Brazil	Satko et al. [7], Slovakia	Li et al. [14], China	Al-khateeb et al. [12], Jordan	Ansari et al. [3], Iran	Williams et al. [8], Jamaica	Kayembe et al. [15], Congo	Otoh et al. [13], Nigeria
Tumor type											
Benign	78.3	67.5	76.3	80	73.9	59.8	70	68.4	70.6	65.6	55.7
Malign	21.7	32.5	23.7	20	26.1	40.2	30	31.6	29.4	34.4	44.3
Sex (%)											
Male	39	41.5	37.4	40	47.4	47.3	44	41	?	35	1.4:1
Female	61	58.5	62.6	60	52.6	52.7	56	59	?	65	?
Age (decade)	4°	5°	3°	4°	6°	4°	4°	5°	?	?	3°
Location (%)											
Parotid gland	68.5	67.7	62	71	83	61.4	49.5	63	66	36.6	45.6
Submandibular gland	15.5	9.5	19	24	10.8	10.8	18.7	23	18	24.3	10.1
Minor salivary gland	14.5	22.8	19	5	3	26.4	31.8	14	16	29	40.6
Histological type (%)											
Pleomorphic adenoma	67.8	54.2	68.5	67.7	53.9	51.3	54	65.4	64.5	55.1	44.3
Adenoid cystic carcinoma	6.5	7.9	5.3	4.0	6.4	7.3	13	2.3	5	15.9	9.6
Warthin's tumor	6.3	8.5	6.9	10.5	9.7	4.4	2	0	5	–	2.5
Adenocarcinoma NOS	5.8	1.4	3.6	4	3.5	6.6	1	4.6	3.3	5.4	2.5
Mucoepidermoid carcinoma	4.8	13.5	4.4	10.4	5.2	7.6	8	11.5	9.5	8	10.1
Total (*n*)	599	496	245	124	1021	3461	102	130	344	266	79

tumor was the third most diagnosed of all salivary gland tumors involving 6.4% of cases, with the majority located in the parotid gland (94.7%). In this work, it was the second most common benign tumor representing 8.2% of cases, as has also been observed in other Brazilian studies [9–11].

Malignant tumors represented 21.7% of all salivary gland tumors. The most frequent in this study was adenoid cystic carcinoma. This is in agreement with findings reported by some investigators [7, 11, 13, 15], but in contrast with other studies that reported mucoepidermoid carcinoma to be the most common malignant tumor [3, 8–10, 13, 14]. Adenocarcinoma NOS was the second most common malignant type, involving 5.8% of all tumors, as described by Ansari et al. [3]. However, in other series, this tumor was the third most frequent [14, 15].

In this study, epidemiological data was compared with other worldwide series regarding the distribution of salivary gland tumors. Women and the parotid gland were the most affected and pleomorphic adenoma was the most frequent lesion, followed by adenoid cystic carcinoma and Warthin's tumor.

Acknowledgments The authors would like to thank FAPEG, FUNAPE, CAPES, CNPq, FO/UFG and IPTSP/UFG for their financial support. The authors are also grateful to Lynne S. P. Brito for her technical support.

References

1. Ellis GL, Auclair PL. Atlas of Tumor Pathology. Tumors of the Salivary Glands. Washington: AFIP; 1996.
2. Seifert G, Sobin LH. World health organization classification of tumours. Histopathological classification of tumors. Berlin, Germany: Springer-Verlag; 1991.
3. Ansari MH. Salivary gland tumors in an Iranian population: a retrospective study of 130 cases. J Oral Maxillofac Surg. 2007;65:2187–94.
4. Eveson JW, Cawson RA. Salivary gland tumours. A review of 2410 cases with particular reference to histological types, site, age and sex distribution. J Pathol. 1985;146:51–8.
5. Spiro RH. Salivary neoplasms: overview of a 35-year experience with 2, 807 patients. Head Neck Surg. 1986;8:177–84.
6. Dardick I, Burford-Mason AP, Garlick DS, et al. The pathobiology of salivary gland. II. Morphological evaluation of acinic cell carcinomas in the parotid gland of male transgenic (MMTV/v-Ha-ras) mice as a model for human tumours. Virchows Arch A Pathol Anat Histopathol. 1992;421:105–13.
7. Satko I, Stanko P, Longauerová I. Salivary gland tumours treated in the stomatological clinics in Bratislava. J Craniomaxillofac Surg. 2000;28:56–61.
8. Williams NP, Boyd DL, Choy L, et al. Salivary gland lesions: a Jamaican perspective. West Indian Med J. 2001;50:62–5.
9. Vargas PA, Gerhard R, Araujo Filho VJ, et al. Salivary gland tumors in a Brazilian population: a retrospective study of 124 cases. Rev Hosp Clin Fac Med Sao Paulo. 2002;57:271–6.
10. Ito FA, Ito K, Vargas PA, et al. Salivary gland tumors in a Brazilian population: a retrospective study of 496 cases. Int J Oral Maxillofac Surg. 2005;34:533–6.
11. Lima SS, Soares AF, de Amorim RF, et al. Epidemiologic profile of salivary gland neoplasms: analysis of 245 cases. Braz J Otorhinolaryngol. 2005;71:335–40.
12. Al-Khateeb TH, Ababneh KT. Salivary tumors in north Jordanians: a descriptive study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2007;103:e53–9.
13. Otoh EC, Johnson NW, Olasoji H, et al. Salivary gland neoplasms in Maiduguri, north-eastern Nigeria. Oral Dis. 2005;11:386–91.
14. Li LJ, Li Y, Wen YM, et al. Clinical analysis of salivary gland tumor cases in West China in past 50 years. Oral Oncol. 2008;44:187–92.
15. Kayembe MK, Kalengayi MM. Salivary gland tumors in Congo (Zaire). OdontoStomatol Tropicale. 2002;25:19–22.